Appendix H0.24

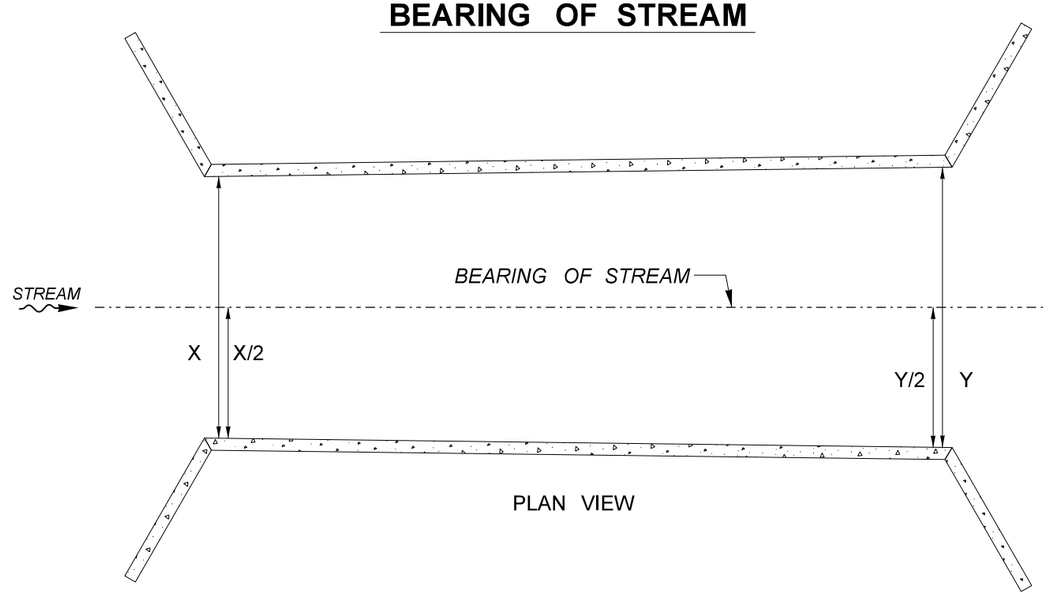
Structure Free Zone Definitions Exhibit

I-90, SR 161, SR 202 & SR 203 - Fish Passage Project

Request for Proposal

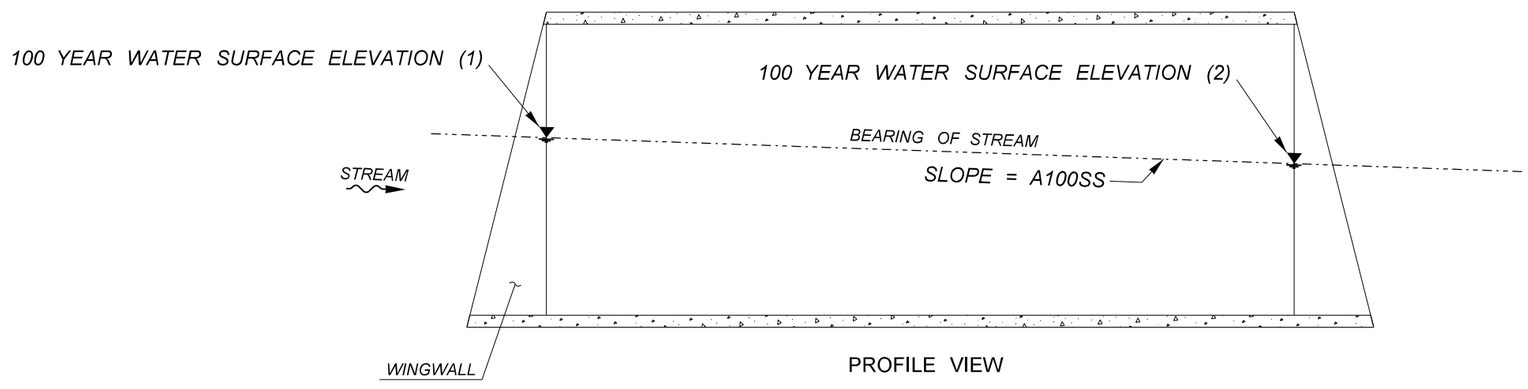
April 21, 2022

BEARING OF STREAM



PLAN VIEW

A100SS = (100 YR WATER SURFACE ELEV 2) - (100 YR WATER SURFACE ELEV 1) / HYDRAULIC LENGTH (SEE SFZ2)



PROFILE VIEW

STRUCTURE FREE ZONE DEFINITIONS EXHIBIT

FILE NAME	\\wsdot.loc\nw\CAE_DATA\412358\DESIGN RESOURCES\Structure Free Zone (SFZ)\SFZ_Sheets.dgn						
TIME	7:57:09 AM				REGION NO. 10	STATE WASH	FED.AID PROJ.NO.
DATE	4/15/2022				JOB NUMBER		
PLOTTED BY	lamaymp						
DESIGNED BY							
ENTERED BY					CONTRACT NO.	LOCATION NO.	
CHECKED BY							
PROJ. ENGR.							
REGIONAL ADM.		REVISION	DATE	BY			

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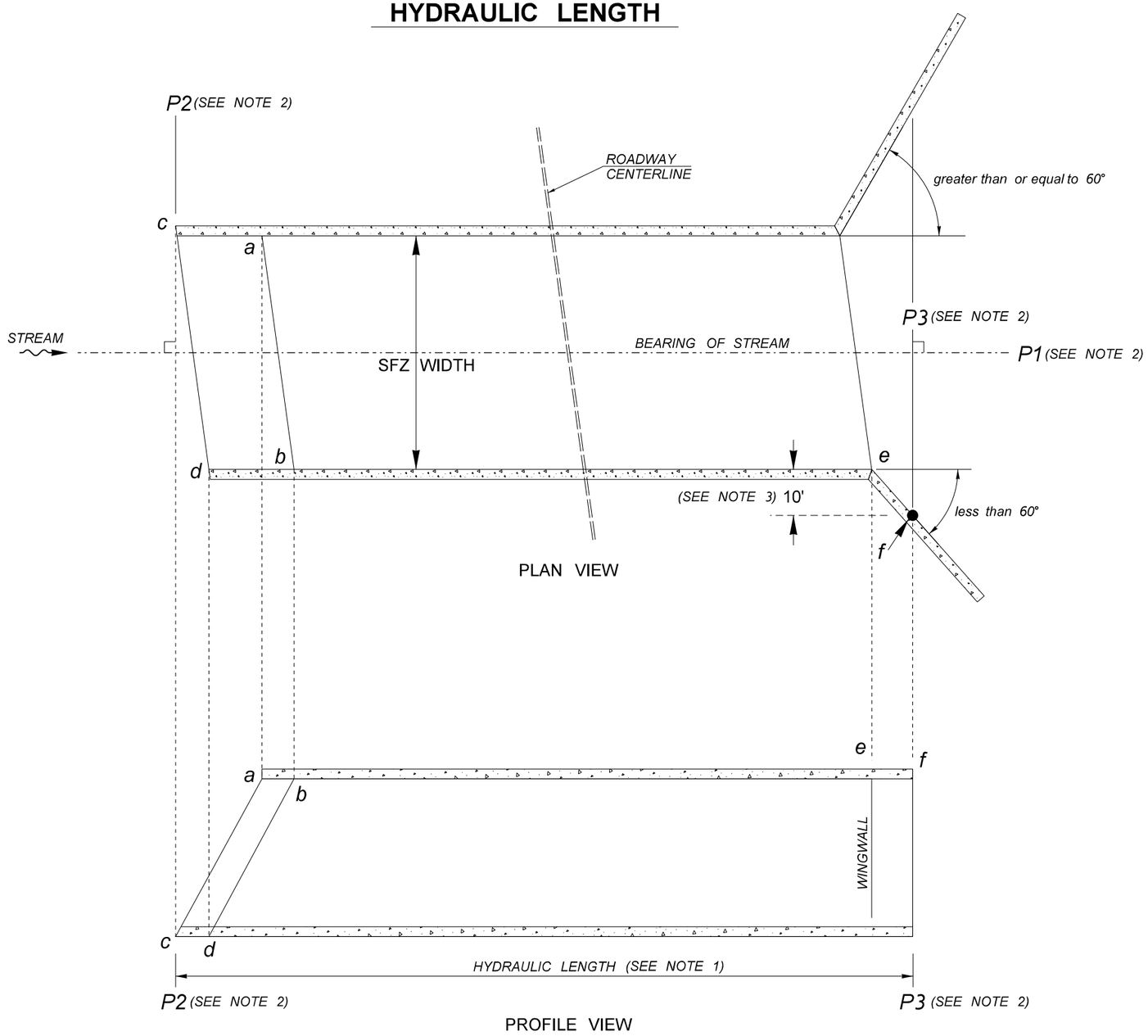
BEARING OF STREAM / A100SS

Plot 11

PLAN REF NO SFZ1

SHEET OF SHEETS

HYDRAULIC LENGTH



NOTES:

1. HYDRAULIC LENGTH IS MEASURED HORIZONTALLY.
2. LET P1 BE A VERTICAL PLANE CONTAINING THE BEARING OF STREAM. LET P2 BE A VERTICAL PLANE, PERPENDICULAR TO P1, AND PASSING THROUGH THE POINT ON THE STRUCTURE THAT IS FURTHER-MOST UPSTREAM (NOT INCLUDING WING WALLS THAT ARE AT A HORIZONTAL SKEW ANGLE OF 60 DEGREES OR GREATER FROM THE BEARING OF STREAM). LET P3 BE A VERTICAL PLANE, PERPENDICULAR TO P1, AND PASSING THROUGH THE POINT ON THE STRUCTURE THAT IS FURTHER-MOST DOWNSTREAM (NOT INCLUDING WING WALLS THAT ARE AT A HORIZONTAL SKEW ANGLE OF 60 DEGREES OR GREATER FROM THE BEARING OF STREAM).
3. THE 10' RULE APPLIES TO WING WALLS AND NO OTHER PART OF THE STRUCTURE ON THIS SHEET.

STRUCTURE FREE ZONE DEFINITIONS EXHIBIT

FILE NAME	\\wsdot.loc\nw\CAE_DATA\412358\DESIGN RESOURCES\Structure Free Zone (SFZ)\SFZ_Sheets.dgn							Plot 12
TIME	7:57:25 AM				REGION NO. 10	STATE WASH	FED.AID PROJ.NO.	PLAN REF NO SFZ2
DATE	4/15/2022				JOB NUMBER			
PLOTTED BY	lamaymp							SHEET
DESIGNED BY								OF
ENTERED BY								SHEETS
CHECKED BY					CONTRACT NO.	LOCATION NO.		
PROJ. ENGR.								
REGIONAL ADM.		REVISION	DATE	BY				

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HYDRAULIC LENGTH

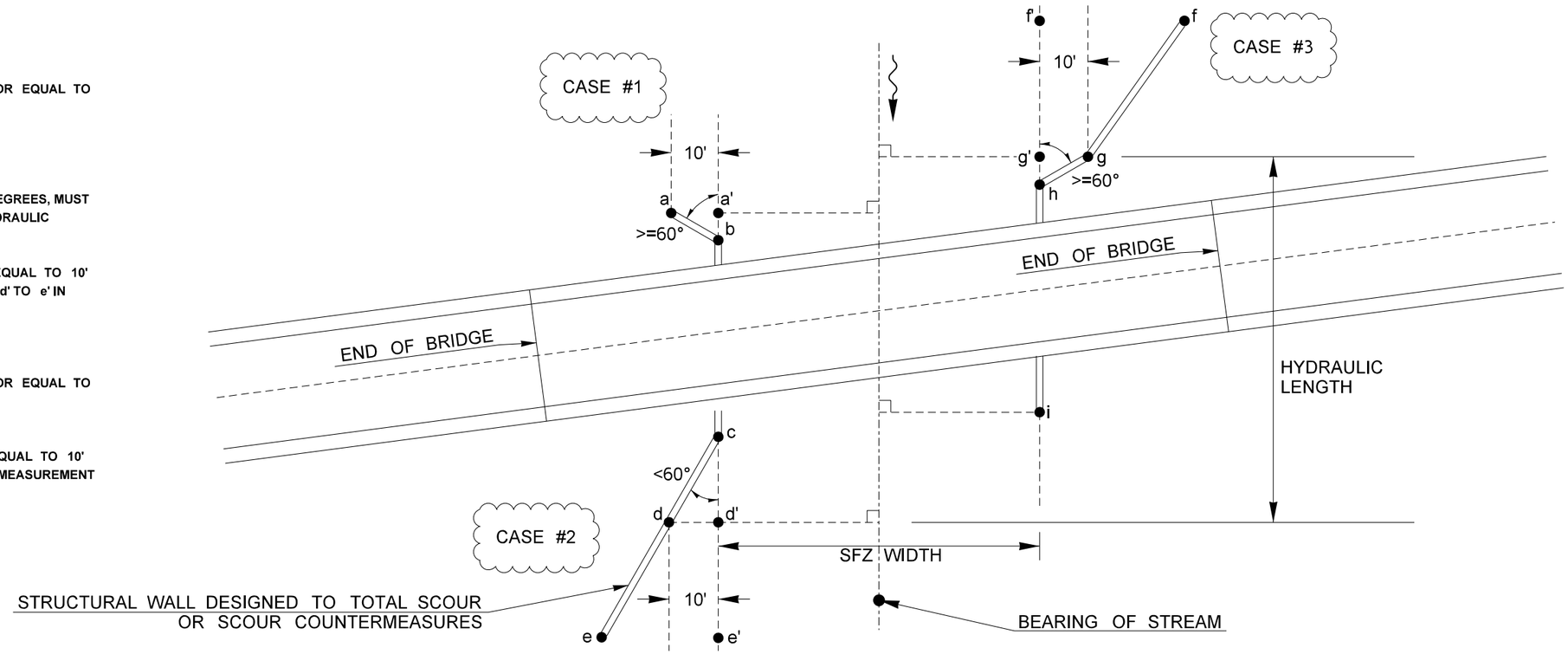
CASE #1
BECAUSE THE ANGLE IS GREATER THAN OR EQUAL TO 60 DEGREES, DO NOT INCLUDE a' TO b IN MEASUREMENT OF HYDRAULIC LENGTH.

CASE #2
BECAUSE THE ANGLE IS LESS THAN 60 DEGREES, MUST INCLUDE c TO d' IN MEASUREMENT OF HYDRAULIC LENGTH.

BECAUSE d TO e IS GREATER THAN OR EQUAL TO 10' OUTSIDE OF SFZ WIDTH, DO NOT INCLUDE d' TO e' IN MEASUREMENT OF HYDRAULIC LENGTH.

CASE #3
BECAUSE THE ANGLE IS GREATER THAN OR EQUAL TO 60 DEGREES, DO NOT INCLUDE h TO g' IN MEASUREMENT OF HYDRAULIC LENGTH.

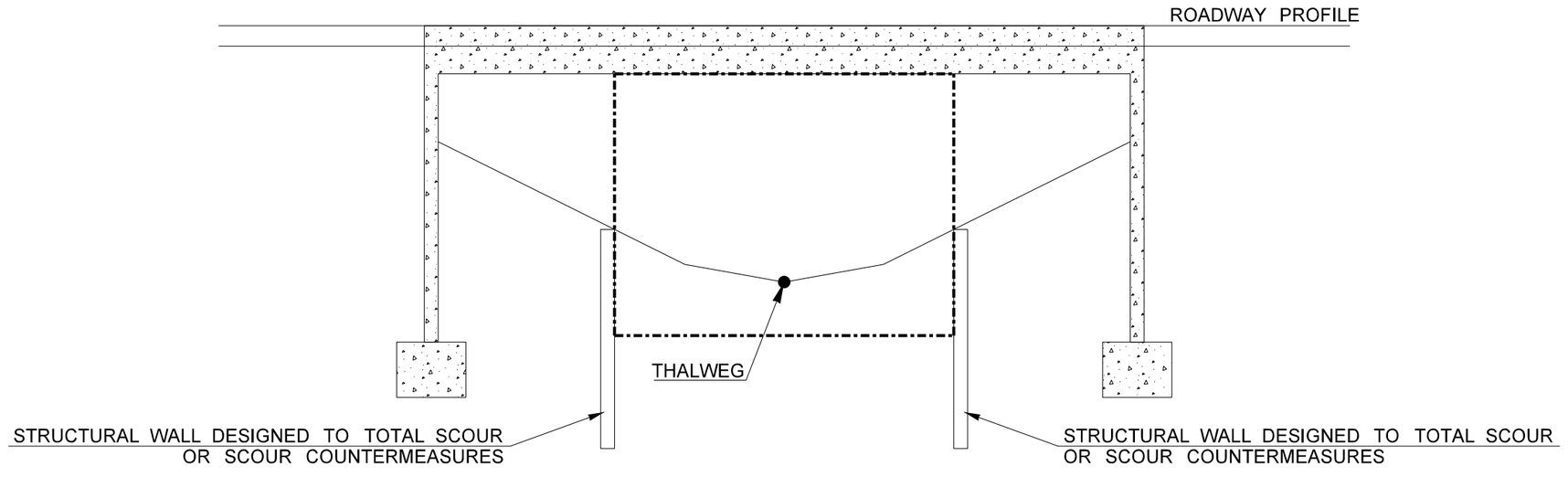
BECAUSE g TO f' IS GREATER THAN OR EQUAL TO 10' BEYOND SFZ, DO NOT INCLUDE g' TO f' IN MEASUREMENT OF HYDRAULIC LENGTH.



NOTES:

1. **REFER TO DEFINITIONS IN TECHNICAL REQUIREMENT 2.30**

- - - - - - - - - - STRUCTURE FREE ZONE



STRUCTURE FREE ZONE DEFINITIONS EXHIBIT

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PROJ. ENGR.							
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HYDRAULIC LENGTH & SCOUR COUNTERMEASURES

Plot 13

PLAN REF NO SFZ3

SHEET OF SHEETS

NOTES:

1. CTE = CONTROLLING TOP ELEVATION
2. CBE = CONTROLLING BOTTOM ELEVATION
3. FILLETS SHALL BE OUTSIDE SFZ PER DETAIL 1 UNLESS:

   A_{F1} = AREA OF FILLET 1

   A_{F2} = AREA OF FILLET 2

   $\sum A_F = A_{F1} + A_{F2}$

   IF: $\sum A_F \leq 2\%$ (SFZ W x SFZ H)

   AND A_F IS ABOVE BOTH

   A) THE ELEVATION CALCULATED AS THE HYDRAULIC DESIGN FLOOD ELEVATION + HYDRAULIC DESIGN FLOOD FREEBOARD

   B) THE ELEVATION CALCULATED AS THE HIGHEST GROUND ELEVATION WITHIN THE HORIZONTAL LIMITS OF THE HYDRAULIC WIDTH + MAINTENANCE CLEARANCE

   THEN: FILLETS MAY BE INSIDE THE SFZ

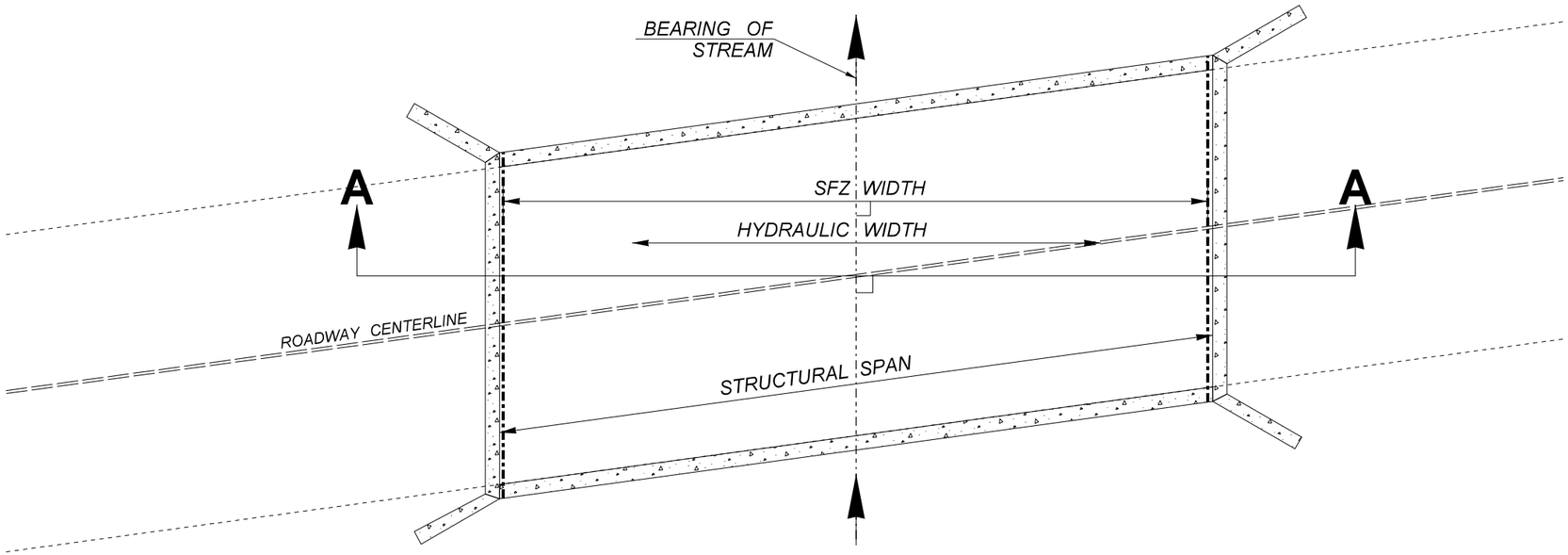
4. MEASURE SFZ HEIGHT AND MAINTENANCE CLEARANCE FROM THE HIGHEST GROUND ELEVATION WITHIN THE HORIZONTAL LIMITS OF THE HYDRAULIC WIDTH.
5. CONTROLLING BOTTOM ELEVATION (CBE) AN IMAGINARY SURFACE THAT REPRESENTS THE BOTTOM BOUNDARY OF THE STRUCTURE FREE ZONE (SFZ). AT ANY VERTICAL CROSS SECTION OF THE SFZ, TAKEN AT A HORIZONTAL ANGLE OF 90 DEGREES TO THE BEARING OF STREAM, THE CBE SHALL BE A HORIZONTAL LINE LOCATED:

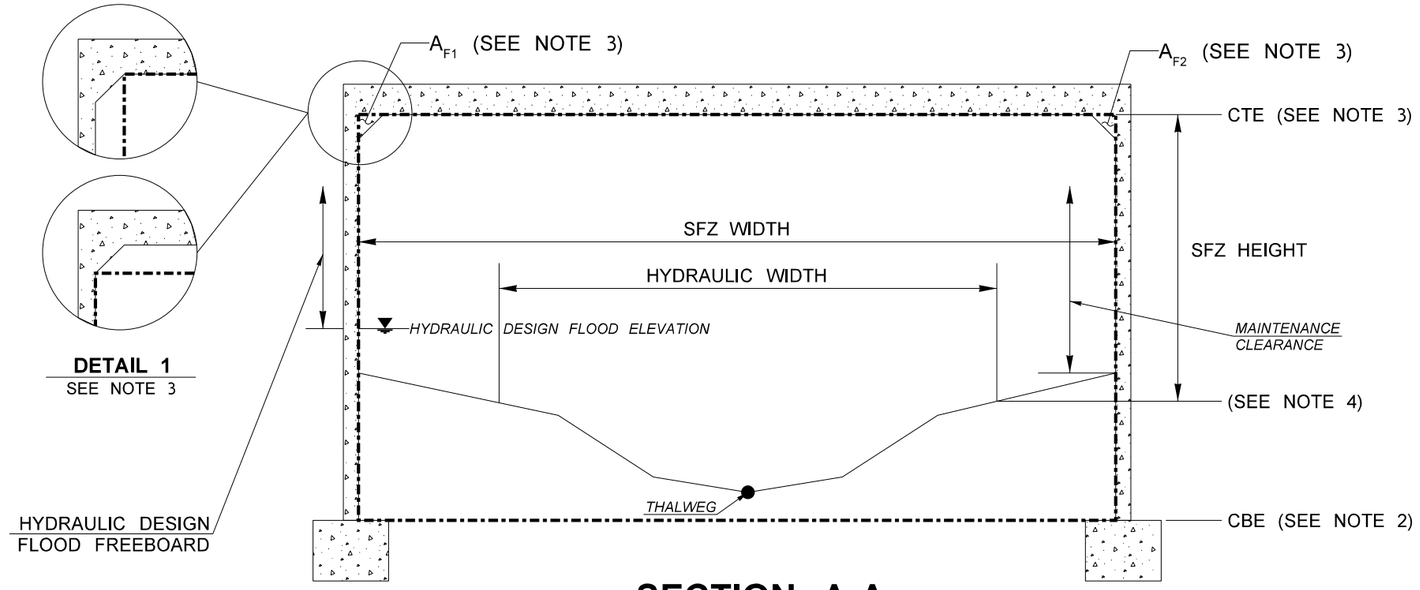
   a) WHEN ANY PART OF THE STRUCTURE OR ITS FOUNDATION IS LOCATED UNDER THE SHADOW OF THE HYDRAULIC WIDTH WHEN THE SHADOW IS ORTHOGONALLY PROJECTED TOWARDS A HORIZONTAL PLANE BELOW THE SFZ, THE CBE SHALL BE AT THE LOWEST OF THE FOLLOWING ELEVATIONS:

      i) TWO FEET BELOW THE ELEVATION OF TOTAL SCOUR FOR THE SCOUR DESIGN FLOOD.
      ii) THE ELEVATION OF TOTAL SCOUR FOR THE SCOUR CHECK FLOOD.

   b) WHEN NO PART OF THE STRUCTURE OR ITS FOUNDATION IS LOCATED UNDER THE SHADOW OF THE HYDRAULIC WIDTH WHEN THE SHADOW IS ORTHOGONALLY PROJECTED TOWARDS A HORIZONTAL PLANE BELOW THE SFZ, THE CBE SHALL BE AT THE ELEVATION OF TOTAL SCOUR FOR THE SCOUR CHECK FLOOD, OR LOWER.

   c) WHEN SPECIFICATIONS FOR SCOUR REQUIRE THE TOP OF FOUNDATIONS TO BE DEEPER THAN ALLOWED BY THE CONTROLLING BOTTOM ELEVATION DETERMINED BY 1 AND 2 ABOVE, THE SCOUR SPECIFICATIONS SHALL CONTROL.





SECTION A-A

STRUCTURE FREE ZONE

STRUCTURE FREE ZONE DEFINITIONS EXHIBIT

FILE NAME	\\wsdot.loc\nw\CAE_DATA\412358\DESIGN RESOURCES\Structure Free Zone (SFZ)\SFZ_Sheets.dgn						
TIME	7:57:52 AM				REGION NO. 10 / STATE WASH	FED.AID PROJ.NO.	
DATE	4/15/2022						
PLOTTED BY	lamaymp				JOB NUMBER		
DESIGNED BY							
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CHECKED BY					CONTRACT NO.	LOCATION NO.	
PROJ. ENGR.							
REGIONAL ADM.		REVISION	DATE	BY			

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CTE, CBE, SFZ WIDTH & SFZ HEIGHT

Plot 14

PLAN REF NO SFZ4

SHEET OF SHEETS